CLAIMS:

1. A method of enhancing characteristic properties of a semiconductor, the method comprising annealing a base material at a temperature of 475^0C or less to form the semiconductor.

2. The method of claim 1, wherein the characteristic properties enhanced includes carrier lifetime and resistivity.

3. A method of producing a semiconductor material with photoconductive properties, the method comprising annealing the base material at a temperature of 475^0C or less so as to enhance the carrier lifetime of the material and the resistivity of the material for use as a photoconductor.

4. The method any preceding claim, wherein the annealing occurs at a temperature in the range of 250^0C and 450^0C.

5. The method of any preceding claim, wherein the base material is grown using molecular beam epitaxy.

6. The method according to any one of claims 1 to 4, wherein the base material is produced using As ion implantation

7. The method according to any preceding claim, wherein the base material is formed in a growth chamber and annealing occurs outside the growth chamber.

8. The method according to any preceding claim, wherein the semiconductor is a Group III-V semiconductor with photoconductive properties.

9. The method according to any preceding claim, wherein the semiconductor comprises As.

10. The method according to any preceding claim, wherein the base material is GaAs.

11. The method according to claim 10, wherein the GaAs is grown in a molecular beam epitaxy reactor at a temperature in the range of approximately 200^0C to 300^0C.

12. The method according to any one of claims 1 to 9, wherein the base material is InGaAs.

13. The method of claim 12, wherein the base material is annealed at a temperature in the range from 350^0C to 450^0C.

14. The method according to any preceding claim, wherein the annealing is performed for fifteen minutes or less.

15. A semiconductor material formed using the method according to any preceding claim.

16. A photoconductive element comprising InGaAs, said InGaAs having a carrier lifetime of at most 1 ps.

17. A photoconductive emitter comprising the semiconductor material of claim 15.

18. The emitter of claim 17, wherein the emitter is configured to emit terahertz radiation.

19. A photoconductive receiver comprising the semiconductor material of claim 15.

20. The receiver of claim 19, wherein the receiver is configured to receiver terahertz radiation.

21. A photoconductive antenna comprising a photoconducting substrate and two electrodes provided on the surface of said photoconducting substrate, said

photoconducting substrate comprising InGaAs having a carrier lifetime of less than 1 ps.

22. A method of determining optimal annealing conditions for a semiconductor material comprising:

obtaining a first set of values indicative of resistivity of the material for a plurality of annealing temperatures;

obtaining a second set of values indicative of carrier lifetime of the material for a plurality of annealing temperatures; and

comparing the first and second sets of values to determine an annealing temperature or a range of annealing temperatures where the carrier lifetime and the resistivity of the material are optimized.

23. The method of claim 22, further comprising:

determining an optimum annealing duration for the material.

24. The method of claim 23, wherein the material contains As, and the optimum annealing duration is determined by obtaining a third set of values indicative of arsenic concentration of the material for a plurality of annealing durations and for at least one annealing temperature;

comparing the at least one third set of values with the first and second sets of values to determine an annealing duration and an annealing temperature which together optimize the carrier lifetime and the resistivity of the material.

25. An investigative system comprising:

a laser configured to emit a pump beam having a wavelength in the range from 1.3 and 1.55 μm,

an emitter configured to emit emitted radiation in response to irradiation by said pump beam; and

a detector for detecting said emitted radiation,

wherein either or both of the emitter or detector comprise InGaAs.

26. A method of enhancing the properties of a semiconductor as substantially hereinbefore described with reference to any of the accompanying figures.

27. A method of producing a semiconductor as substantially hereinbefore described with reference to any of the accompanying figures.

28. A method of determining optimum annealing conditions for a semiconductor as substantially hereinbefore described with reference to any of the accompanying figures.

29. An investigative system as substantially hereinbefore described with reference to Figure 10.